A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects

http://www1.eere.energy.gov/cleancities/electric_vehicle_projects.html

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CENTER FOR CLIMATE AND ENERGY SOLUTIONS

Clean Cities
Electric Vehicle Spring 2014 Quarterly Discussion Webinar
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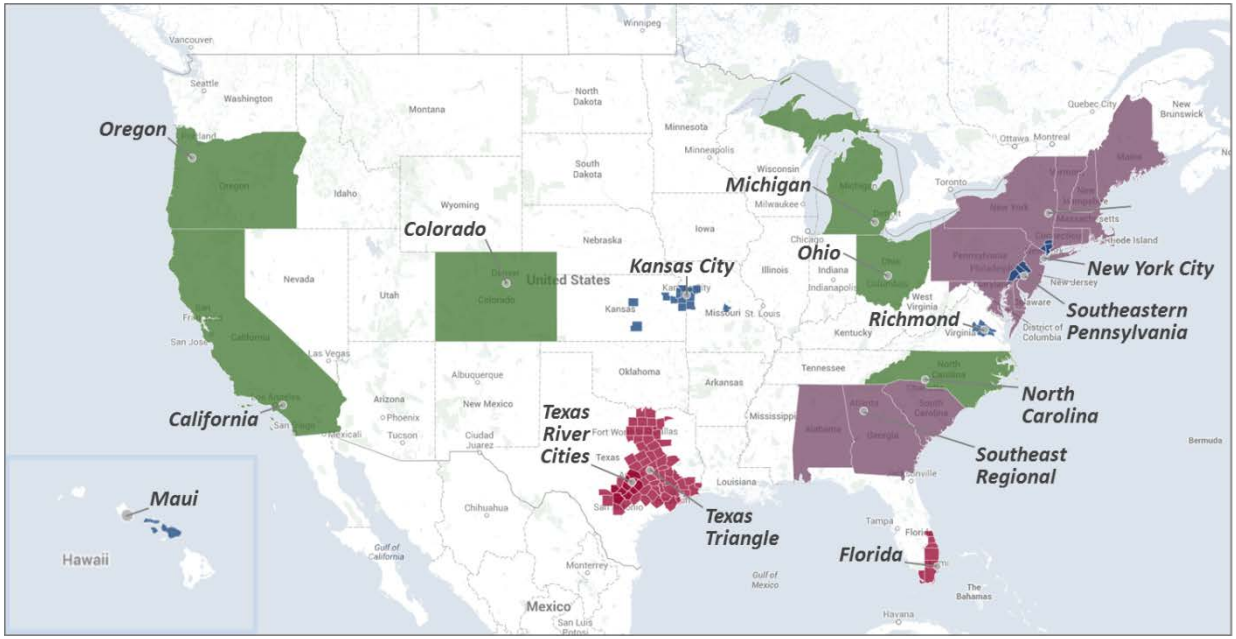
C2ES.ORG

About Center for Climate and Energy Solutions

- Independent, nonpartisan, nonprofit organization
- Working to advance strong policy and action to address the twin challenges of energy and climate change
- Founded in 1998 as the Pew Center on Global Climate Change
- Became C2ES in 2011
- Consistently named one of the world's top environmental think tanks (Univ. of Pennsylvania survey)

The Clean Cities Community Readiness and Planning for Plug-In EV and Charging Infrastructure awards

- **Designed to help communities plan for and develop strategies to support the adoption of PEVs and charging infrastructure installation**
  - $8.5 million issued to 16 communities (local, regional, state, multistate) across 24 states and DC
  - Year-long projects to assess the barriers to and opportunities for PEV deployment, facilitate local partnerships, and produce replicable plans

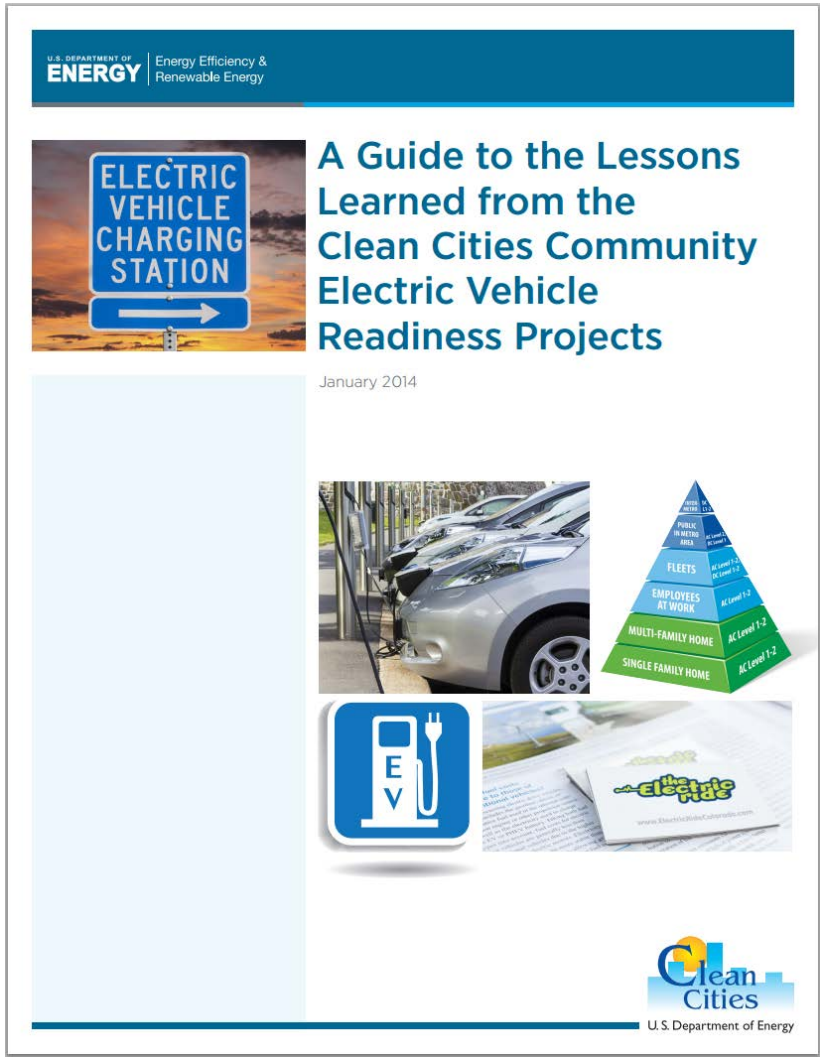


The Clean Cities Community Readiness and Planning for Plug-In EV and Charging Infrastructure awards

- **Sixteen final Readiness Plans reflecting diverse activities and findings**
  - Each addresses a unique environment
    - Geography
    - Consumer demographics
    - Infrastructure
    - Politics
    - Familiarity with EVs, etc.
  - Each focuses their self-identified highest priority areas for EV readiness

New report: A Guide to the Lessons Learned from the Clean Cities Community EV Readiness Projects

- **Purpose of this report:**
  - Synthesize EV readiness lessons learned
  - Highlight key grantee activities and outcomes
  - Help readers easily connect with the resources most relevant to them
  - Designed to be accessible to and useful for a broad, general audience
  - Public sector policymakers and staff, stakeholders, and the general public in communities across the country



How readers can use the Guide to the Lessons Learned to connect with high-value information

1. Executive summary

- High-level findings
- Reader can identify areas of particular interest

2. In-depth sections

- More detail on notable grantee activities, findings, resources produced, and open questions identified

3. Readiness plan content

- Detailed findings, descriptions of activities, methodologies, and tools

TABLE 12: Selected content on charging station challenges at multi-unit dwellings and the workplace available in Readiness Plans

PLAN	CONTENT	WHERE TO FIND THIS CONTENT
California	Opportunity Charging Analysis	Bay Area Plan p. 24
	Planning for Charging in Multi-unit Dwellings and at the Workplace	Southern California p. 47, 69
Colorado	Installation Plan for Multi-unit Residential Areas	p. 62
Florida	PEV Charging at Multi-Unit Dwellings	Volume I Section 6-68
North Carolina	Workplace charging	p. 59, 67, 70
New York City	Charging at shared parking areas	Include when released
Northeast Regional	Workplace and multi-family cluster descriptions and case studies	p. 26, 50
Oregon	Workplace charging survey	p. 31
Richmond	Promoting Workplace and Multi-unit Charging	p. 41
Southeastern	Workplace and Private Access EVSE	Volume 1 p. 6

Overview of Report Presentation

- **PEV Benefits**
- **PEV-Related Incentives**
- **Charging Stations**
  - Power Levels
  - Design, Installation, and Use
  - Siting
- **Role of Local Governments**
- **Role of Electric Utilities**
- **Outreach, Training, and Marketing**
- **Next Steps – Sustaining Partnerships**

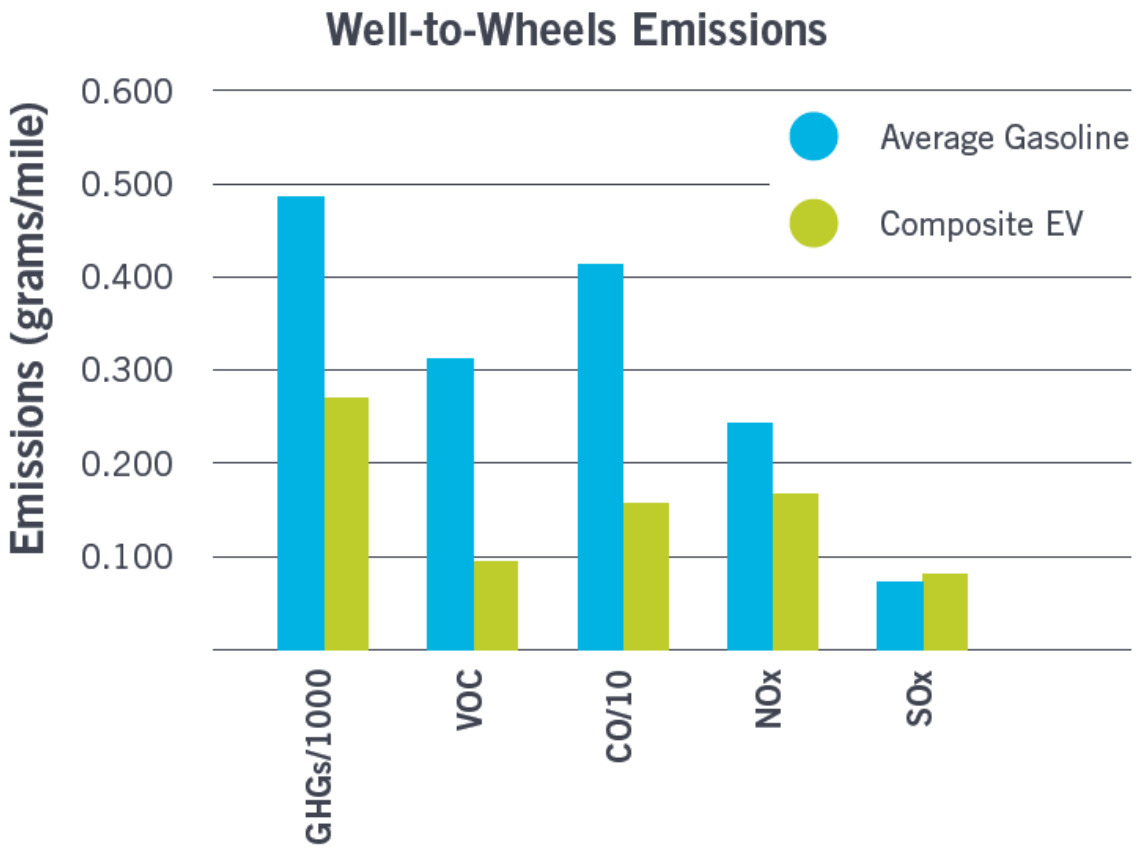
PEV Benefits (1 of 4)

- **PEVs are one part of a suite of solutions for:**
  - Emissions reduction
  - Use of renewables
  - Energy security
  - Affordable transportation
  - Local economies and communities

Guide: Section 2.1 and Table 3

PEV Benefits (2 of 4)

- **Colorado grantee performed a well-to-wheels life cycle analysis to compare the emissions of PEVs with conventional vehicles**
  - Study was the first of its kind in the state
  - Took emissions from electricity generation into account
  - Emissions from PEVs consistently lower than emissions from conventional vehicles



Guide: Section 2.1 and Table 3

PEV Benefits (3 of 4)

- **The Ohio grantee analyzed the local economic impacts of fuel savings from PEV adoption in the state**
  - Only 16.4 cents per dollar spent on gasoline continues stay in Ohio economy
  - Saving money on gas increases local spending
  - $1,300 economic benefit per PEV adopted in the state

Economic Impact of Shift in Spending for 1,000 EV Owners

	Output
Change in spending patterns	$2,005,000
Loss of gasoline impacts	-$685,000
Net change in impact	$1,320,000

Guide: Section 2.1 and Table 3

PEV Benefits (4 of 4)

- **The California grantee explored the opportunity for PEVs to leverage renewable electricity resources**
  - 39 percent of PEV owners in the state also invested in residential solar energy systems
  - Home solar panels, coupled with battery storage vs. grid power
  - Lower-emitting
  - Sometimes less expensive
  - Electric utilities could incorporate renewable energy options into existing or future PEV rates

Source: kcet.org

Guide: Section 2.1 and Table 3

PEV-Related Incentives

- **National and some state and local incentives are making early PEV adoption more favorable**
  - PEVs and charging station incentives
  - Financial and non-financial
  - Building incentives for charging readiness
  - Incentives for off-peak charging
  - Incentives for fleets and heavy duty vehicles

North Carolina grantee compiled a detailed list of incentives throughout the country and analyzed policy implications

NC PEV Incentive Prioritization

Incentive Type (*Refer to endnotes for detailed information on specific incentive)*	**Perceived level of effectiveness to spur more rapid PEV adoption in NC** (Rank 1 -5 with 5 being the most effective)	**Feasibility** (Rank 1-5 with 5 being the most feasible)	**Priority to be recommended for 2013 legislature**(1 - 5 with 5 being the most important)	**Long term priority** (mark x)	**Easiest to implement** (rank 1-3, with 3 being the easiest)
Manufacturer PEV credit for membership to Clean Cities Coalition ($750)[1]	2.8	2.9	2.4	x	2

Guide: Section 2.4-A and Table 9

Charging Stations

- Power Levels
- Design and Installation
- Business Considerations
- Siting

Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Power Levels (1 of 1)

- **Charging stations can meet specific location and vehicle needs by providing appropriate features and power levels**
  - What is optimal charging power level to install given tradeoffs between charging speed and cost (both up-front and operational)?

TABLE 2: Comparison of PEV Charging Levels

CHARGE LEVEL	VOLTAGE	CURRENT	POWER	POWER SIMILAR TO…	TIME TO FULLY CHARGE AN AEV †
Level 1 AC	120 V	8-12 amps	1.0-1.4 kW	Toaster	8–24 hours
Level 2 AC	240 V	15–100 amps	3.6–19.2 kW	Clothes dryer	4–8 hours
DC Fast-Charger	480–600 V	80–120 amps	20–72 kW	5–10 Central air conditioners	30 minutes

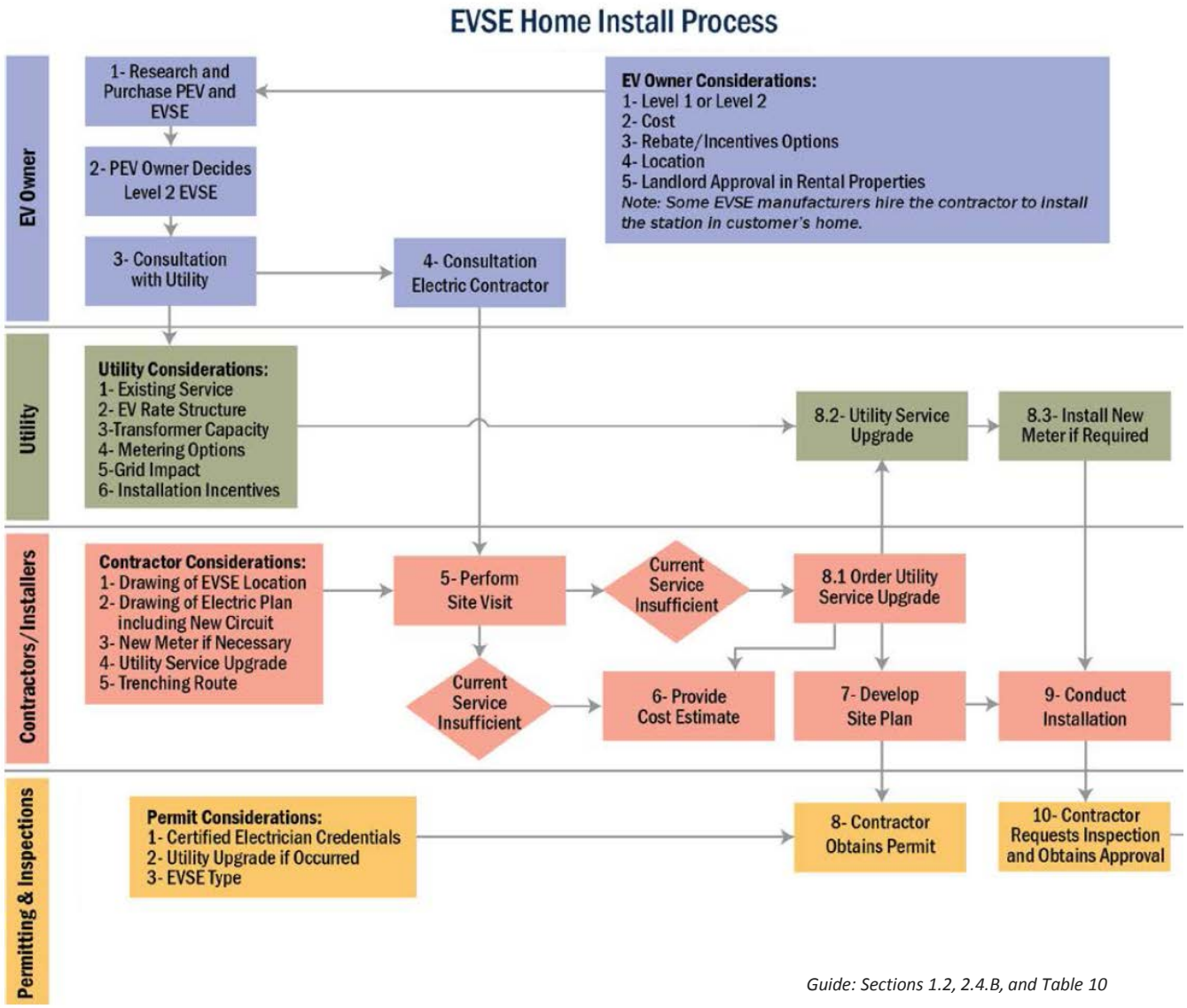
† AEV refers to a vehicle with a usable battery capacity of approximately 24 kWh.

Current PHEVs "need" fewer, lower-powered charging stations (perhaps only ~3 to 4 kW) while AEVs require more, high-powered stations (at least ~6 kW). Very high-powered public stations needed for long AEV trips.

Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Design and Installation (1 of 3)

- **Texas River Cities grantee developed a best practices guide for charging station installation**
  - Checklist of design and siting considerations
  - Flowcharts with detailed roles and responsibilities



Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Design and Installation (2 of 3)

- **Panel capacity and proximity are important considerations**
  - Available electrical panel capacity can limit high-power charging, especially DC fast charging
  - New panels expand opportunities but add cost
  - Station proximity to electrical panel is an important cost factor
    - For existing: locate closer
    - For new: lay conduit during construction to avoid costly trenching

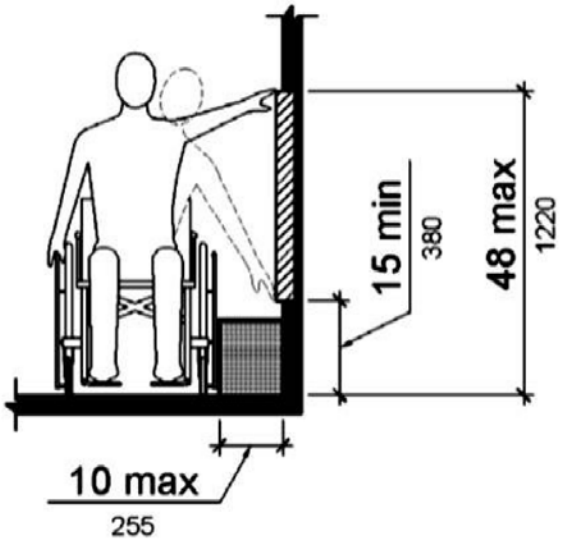
Source: Florida grantee report

Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Design and Installation (3 of 3)

- **ADA compliant design is an important concern**

Richmond and Ohio grantees produced report on ADA compliant siting and design guidelines



Northeast Regional grantee provided illustrations of ADA compliant design

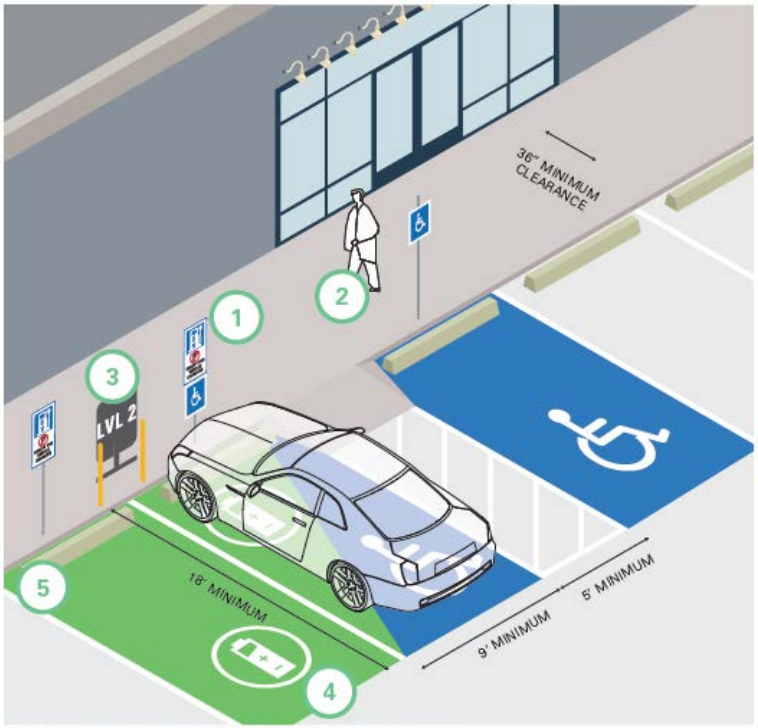
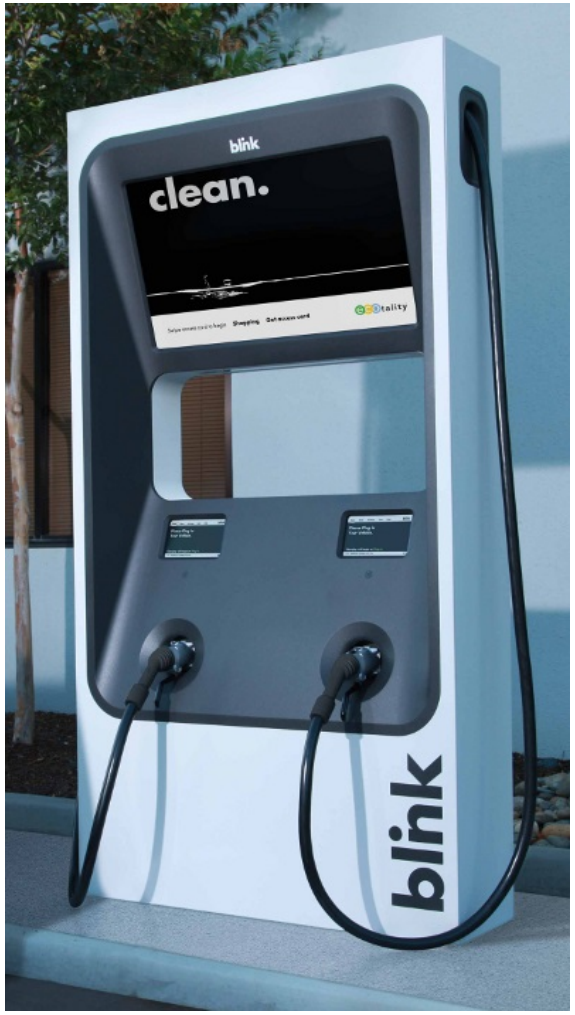


FIGURE 15. SITING AND DESIGN GUIDELINES FOR A COMMERCIAL LOT

Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Business Considerations (1 of 3)

- **Financial challenges to charging station installation and use**
  - Difficulty establishing profitable business case for charging stations
    - Low early utilization rates
    - Low margins on electricity sales
    - Demand charges
    - Regulated electricity markets (resale?)



Source: ECOtality

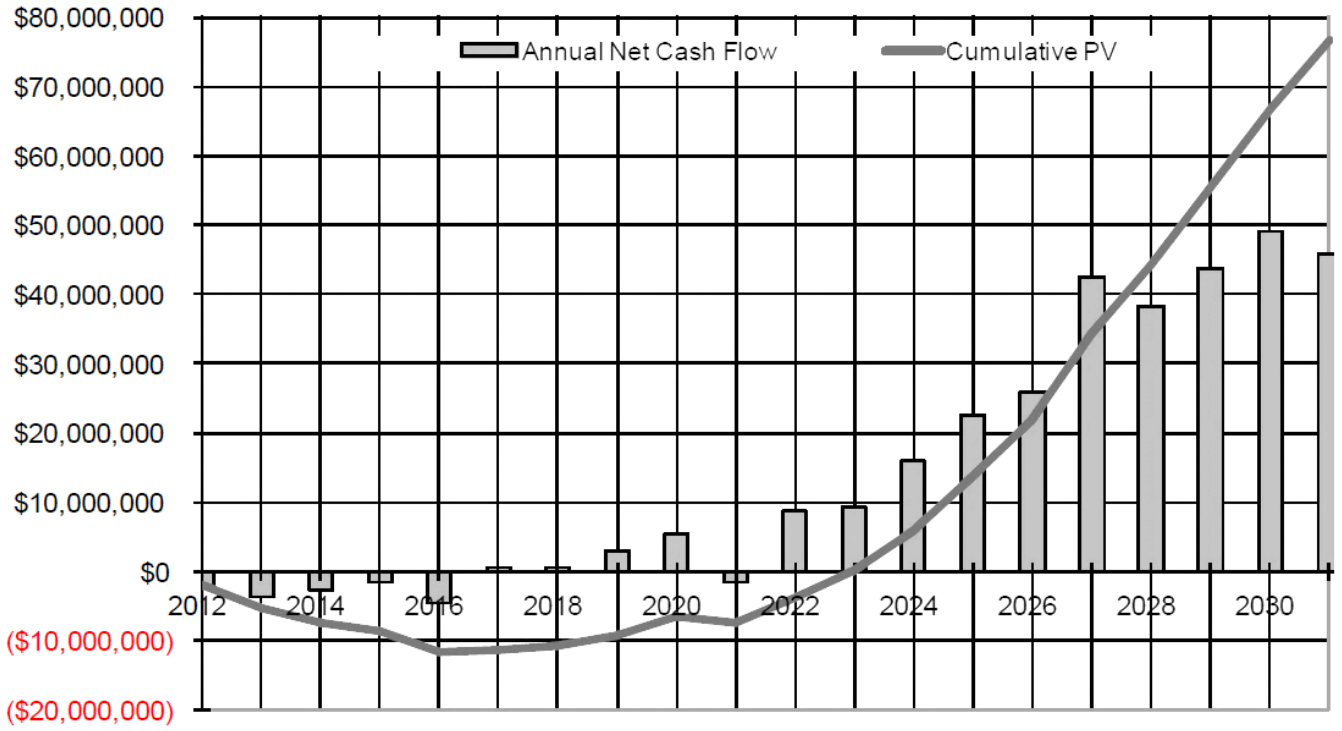
Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Business Considerations (2 of 3)

- **Texas River Cities grantee developed financial models for business case evaluation**
  - Allow investors to evaluate expected financial return
  - Can input various assumptions, such as price and usage

Results of Utility Case Study #3: EVSE Owner/Operator

	5-Year	10-Year	15-Year	20-Year
Net Present Value	($11,684,980)	($7,353,549)	$21,789,415	$76,677,564
Internal Rate of Return	NA	NA	20.6%	27.4%



Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Business Considerations (3 of 3)

Demand charge costs facing public stations

Oregon grantee highlighted the cost challenge of demand charges

- High-power fast chargers or sites where many PEVs will be charging at once
  - Retail or workplaces: where several PEVs charge simultaneously during the day
- Adds to challenge of establishing profitable business case

California grantee considered demand charge workarounds for site managers

- Install lower-powered chargers where PEVs are parked for longer periods
- Regulate charger usage to times of day when demand charges are lower

Source: solarenergy-usa.com

Guide: Section 2.4.E and Table 13

Charging Stations: Siting (1 of 4)

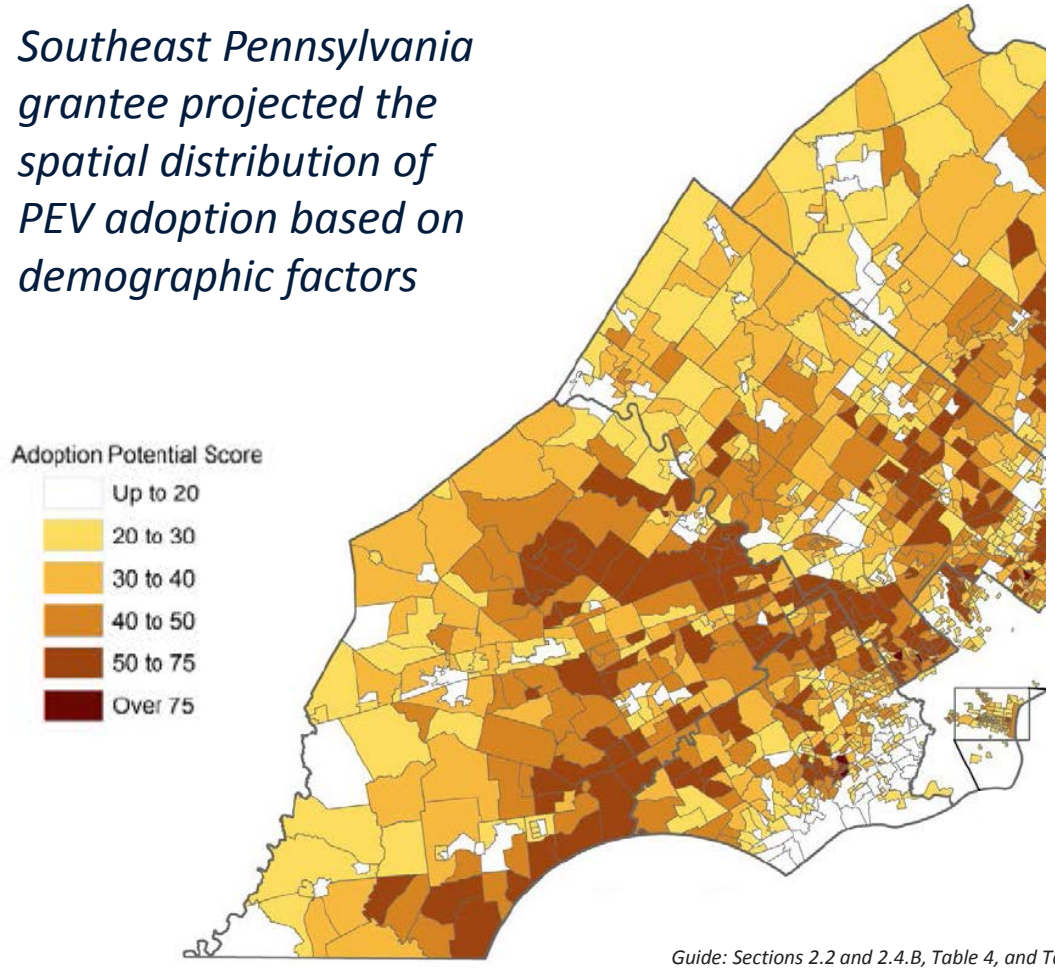
- **Charging stations will be needed in a variety of settings and power levels**
  - Residential, workplace, and fleet
  - Publicly-accessible charging stations in local communities
    - Curbside charging
    - Fast charging
    - Geographic siting analyses for efficient deployment
  - Publically-accessible charging stations along transportation corridors
  - Site design and installation best practices for charging stations

Guide: Sections 1.2, 2.4.B, and Table 10

Charging Stations: Siting (2 of 4)

- **Understanding where PEV adoption is likely informs planning**
  - Forecasting local PEV adoption
    - Scenario analyses
    - Identification of potential growth regions

Southeast Pennsylvania grantee projected the spatial distribution of PEV adoption based on demographic factors



Guide: Sections 2.2 and 2.4.B, Table 4, and Table 10

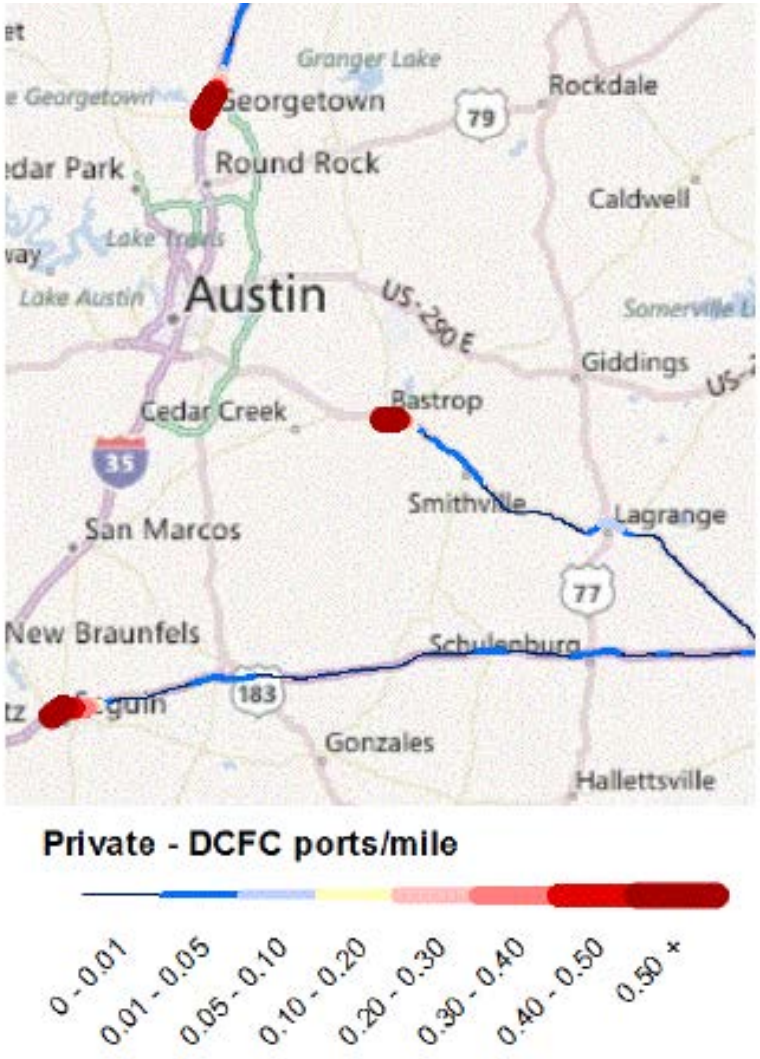
Charging Stations: Siting (3 of 4)

- **Northeast Regional grantee identified nine sweet-spot station location types**
  - Site characteristics
  - Opportunities
  - Issues
  - Case studies

Guide: Section 2.4.B and Table 10

Charging Stations: Siting (4 of 4)

- **Texas Triangle grantee analyzed where private investment alone might provide charging stations along major transportation corridors**
  - Assumed upfront cost, operating costs, and demand density
  - Some corridor stations profitable within 5 to 10 years
  - Public funding for charging stations still necessary for many locations



Guide: Section 2.4.B and Table 10

Workplace charging (1 of 2)

- **Providing access to charging at the workplace is especially challenging, and important**
  - Key considerations and obstacles
    - Low early demand
    - Low familiarity
    - Physical constraints
    - Legal restrictions
    - Difficulty reaching consensus among stakeholders
      - Employees, employers, owners and mangers of shared parking facility, potential funder/owner of charging stations
      - Fairness, etiquette, equipment cost, free vs. fee

Guide: Section 2.4.D and Table 12

Workplace charging (2 of 2)

- **Oregon grantee interviewed employers who offer workplace charging to understand their motivations and experiences**
  - Motivating factors
    - Green marketing benefits
    - Availability of financial incentives
  - Employee "champion" of installation also critical
  - Identified both real and perceived issues making organizations reluctant

Guide: Section 2.4.B and Table 10

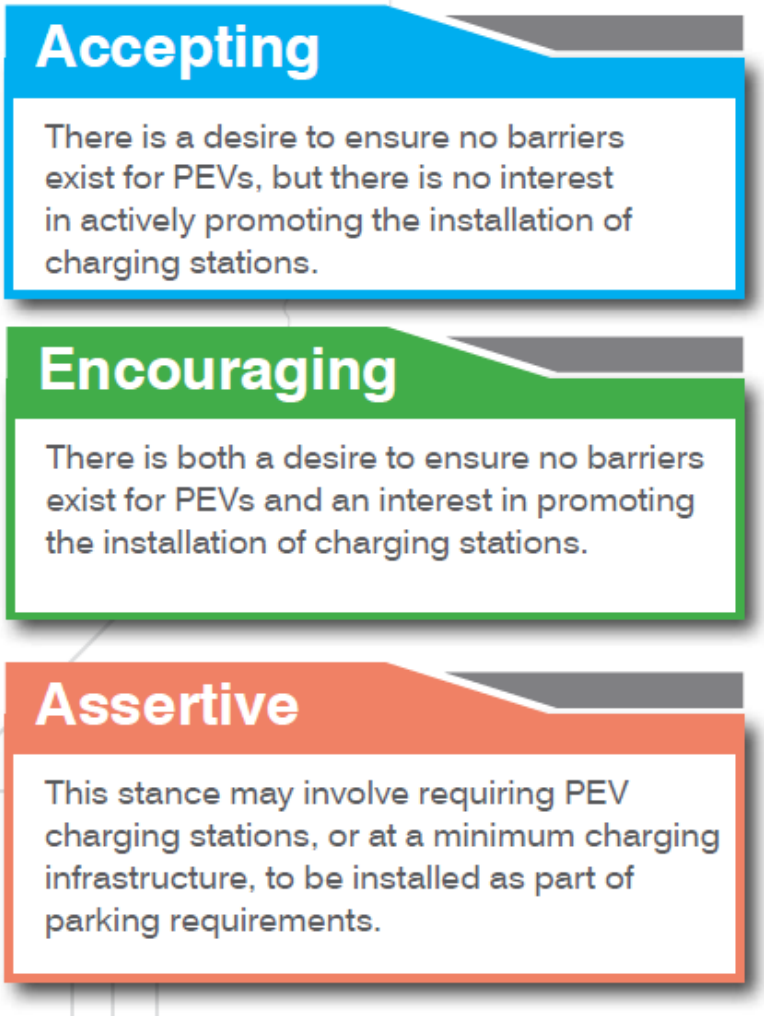
Role of Local Governments (1 of 2)

- **Local governments can be powerful supporters of charging station deployment**
  - Toolkits providing case studies, model ordinances, and planning guidance
    - Master plan language
    - Standard definitions of PEV-related terms in local codes
    - Zoning ordinance updates
    - Building and electrical codes: clarification and/or active support
    - Prudent streamlining of permitting and inspection
  - Public parking regulation, enforcement, and signage

Guide: Section 2.4.C and Table 11

Role of Local Governments (2 of 2)

- **Michigan grantee's toolkit provides sample code language and alternatives presented based on the community's desired level of EV support**



Guide: Section 2.4.C and Table 11

Role of Electric Utilities (1 of 3)

- **Understand and plan for PEV adoption**
  - Potential impacts on local distribution infrastructure
  - Ability of existing generation capacity to meet electricity demand
- **Notification protocols**
  - PEV adoption
  - Charging station installation
- **Alternative electricity rate structures such as TOU rates**
- **Planning for distribution grid upgrades**
- **Providing charging services and/or supporting third party charging services**
- **Exploring smart grid technologies**

Guide: Section 2.4.E and Table 13

Role of Electric Utilities (2 of 3)

- **Roles of utilities and third-party providers in supporting charging infrastructure development**

- Ohio grantee justification of why charging providers can legally resell electricity in the state, despite uncertainty
- Kansas City grantee considered cost recovery allowances for utility investment in charging stations

Source: urbantimes.co

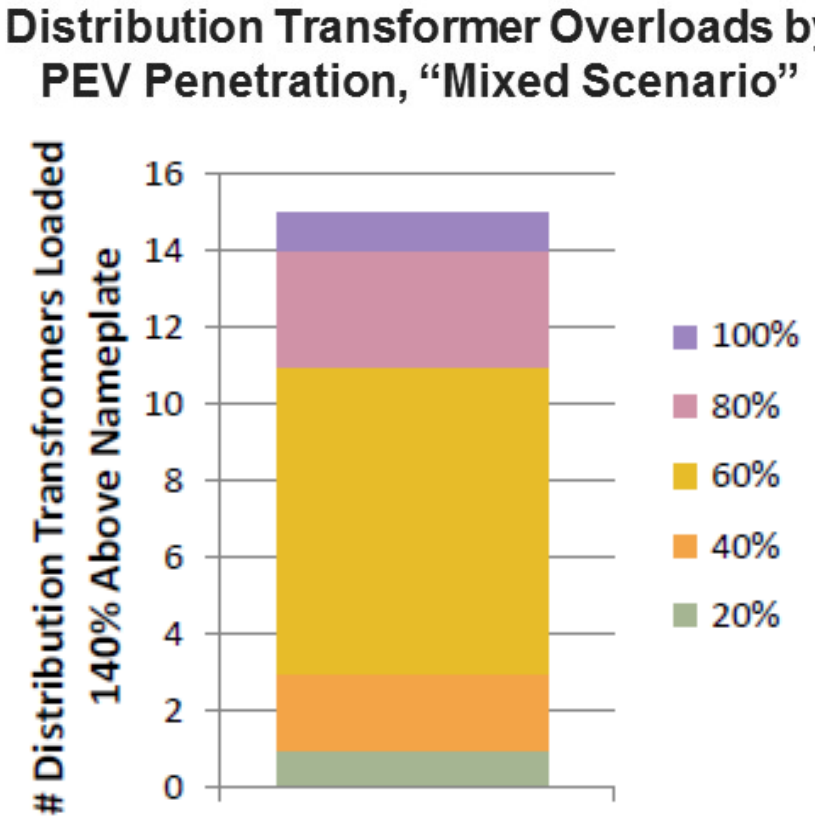
Guide: Section 2.4.E and Table 13

Role of Electric Utilities (3 of 3)

- **Grid impacts**

Kansas City grantee model to test for weak points in the distribution infrastructure under various scenarios of PEV adoption

- PEVs 1 percent of light-duty vehicles: no impacts
- PEVs 20 percent of light-duty vehicles: some stress on local residential distribution systems



Guide: Section 2.4.E and Table 13

Outreach, Training, and Marketing (1 of 1)

- **Communications programs to heighten awareness and disseminate general information**
  - Maui: PEV television program
  - Oregon: ride-and-drive events
  - California: community workshops
  - Kansas City: cost-of-ownership tool promotion
  - Colorado: informational website
  - Richmond: press conferences
  - Ohio: templates for localities to inform citizens
  - New York City: info for 3-1-1 system
- **Training and outreach programs**

Guide: Section 2.4.G and Table 15

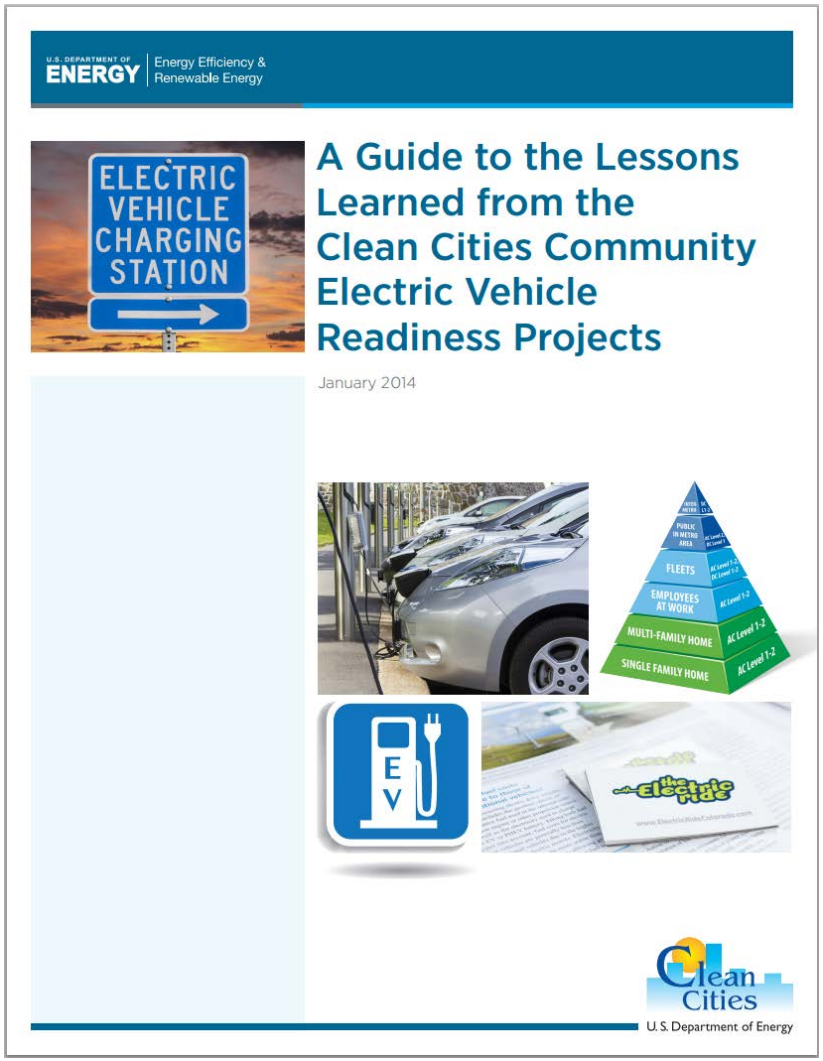
Next Steps – Sustaining Partnerships

- **Partnerships with a wide range of stakeholders are essential for advancing PEV adoption**
  - Local and state policymakers and regulators
  - Regional planners
  - Electric utilities / power providers
  - Developers and commercial businesses
  - Charging station providers
  - Automobile manufacturers and dealers
  - Vehicle fleet managers

Source: North Carolina grantee

Guide: Section 2.4.H and Table 16

Questions?



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